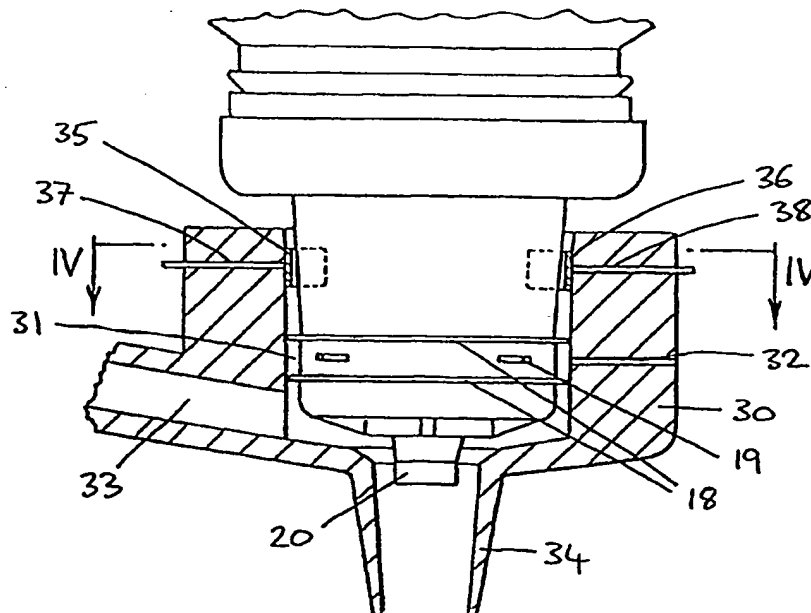




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(54) Title: DRINK DISPENSER, CONCENTRATE DETECTOR, AND CONCENTRATE CONTAINER



(57) Abstract

There is disclosed an apparatus for determining whether a drink dispensing machine which dispenses drinks comprising a concentrate and a diluent is able successfully to dispense a particular drink. The apparatus comprises a detector for detecting whether a container holding the concentrate contains more than a predetermined minimum amount of concentrate.

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DRINK DISPENSER, CONCENTRATE DETECTOR,
AND CONCENTRATE CONTAINER

The present invention relates to drink dispensers and is particularly concerned with an apparatus for determining
5 whether a drink dispenser is able successfully to dispense a drink.

Drink dispensers generally comprise a source of diluent and a flavoured concentrate supply means arranged
10 so that concentrate is mixed with discharged diluent to add flavour to it. The diluent may for example be water, which may or may not be carbonated, to be added to an appropriate concentrate such as cola, lemon and lime, beer, tea or coffee or it may be milk to be added to a
15 milk shake concentrate or tonic water to be added to a spirit such as vodka or gin. The concentrate is usually in liquid form but may for example be a powder. The concentrate is generally supplied in a replaceable container but may be contained in a refillable reservoir.

20 A problem arises when the concentrate supply means is exhausted and the user is then supplied with an unflavoured or insufficiently flavoured drink. This is especially troublesome when the user has paid for his drink or has been debited from a so-called "smart card"
25 which authorises the delivery of a particular number of drinks. The user then feels aggrieved and will be hesitant to use the drink dispenser in future, fearful of losing his money or credits. The user may also seek

a refund which is burdensome for the dispenser operator to administer.

According to an aspect of the present invention, an apparatus for determining whether a drink dispenser for dispensing a drink comprising a diluent and a concentrate is able successfully to dispense a drink comprises a detector for detecting whether a container for holding concentrate for a drink to be dispensed has sufficient concentrate to make a drink.

By detecting whether a container for containing concentrate for a drink to be dispensed has sufficient concentrate to make a drink, the apparatus can reliably determine whether a drink including the detected concentrate can be dispensed. The drink to be dispensed will ideally contain an amount of diluent and a predetermined target amount of concentrate, and the detection means will preferably determine whether or not the target amount of concentrate can be dispensed. However, there may be circumstances in which a drink having a lesser amount than the target amount of concentrate may nevertheless be of an acceptable quality. In such a case, the detection means may be arranged either to signal an insufficiency of concentrate only when the remaining concentrate reaches the lesser amount, or to signal a sufficiency when the remaining concentrate exceeds the lesser amount. As a further alternative, a first signal may be provided to indicate sufficiency, and a second signal may be provided to indicate an

insufficiency.

According to a further aspect of the present invention an apparatus for determining whether a drink dispenser is able successfully to dispense a drink comprises a support for receiving at least partially a container for holding concentrate for a drink to be dispensed by a drink dispenser; a detector for detecting whether a container received on the support has sufficient concentrate to make a drink; and means for providing an electrical signal indicating whether or not the container has sufficient concentrate to make a drink.

When it is determined that the dispenser is not able to dispense a selected drink, the means for providing an electrical signal can be used to prevent the dispenser from accepting payment, which may be in the form of money or smart card credits or if the dispenser can dispense a variety of drinks, for indicating that the drink corresponding to that ingredient is not available.

In use, the detector preferably does not compromise the integrity of a container mounted in the support. The detector preferably has a structure which is external to a container received on the support and does not intrude into the container's interior. The contents of a received container cannot then be contaminated by the detector.

The detector preferably comprises an electrical circuit with a component having a dielectric and concentrate in a container received on the support

preferably acts as the dielectric for said component.

The component preferably comprises a pair of plates forming a capacitor and arranged to be able to detect whether a container received on the support has
5 sufficient ingredient to make a drink. The pair of capacitive plates may be arranged such that, in use, at least a portion of a container is received on the support between them. The capacitance of the detector then varies dependent upon the level of ingredient in a
10 container received on the support. The capacitance of the detector plates may be measured by any suitable electric circuit.

The detector may alternatively comprise a coil arranged such that, in use, at least a portion of a
15 container received on the support is received within the coil. The inductance of the detector coil then varies dependent upon the level of ingredient in a container received on the support. The inductance of the detector coil may be measured by any suitable electric circuit.

20 In a further advantageous embodiment, the detection circuit may be predominantly mounted to the supporting structure, but may have one or more of its electrical components mounted to the container. For example, the container, or a dispenser unit attached to the container,
25 may have capacitor plates fixed thereto at appropriate locations, or may have a coil wound about a part of its structure. The component or components mounted on the container or dispenser unit attached thereto may be

connected to the remainder of an electrical detection circuit by means of contacts positioned on or in the support to engage and electrically connect to the container components.

5 The detector may alternatively comprise a source of electro-magnetic radiation, preferably light, and a corresponding detector arranged to receive radiation emitted from the source transmitted through the interior of a container which is received on the support, and
10 through the contents of the container, if present. The container may be transparent to the radiation, or may have windows to permit the light to enter and leave the container.

 The detector may be arranged with the source on one
15 side of a received container and the corresponding detector on the opposite side. The quantity of radiation received by the detector would then depend upon whether or not ingredient was at a sufficient level in the container to impede or interfere with radiation emitted
20 from the source.

 To detect whether a received container has sufficient ingredient to make a drink, the detector is preferably arranged to detect the presence of ingredient at a lower portion of a received container at a level at
25 which sufficient ingredient is present to provide at least one drink.

 According to a further preferred aspect of the present invention a drink dispenser comprises a diluent

supply means; a support for receiving at least partially a container for holding concentrate for a drink to be dispensed by the drink dispenser; means arranged, in use, to activate the supply of concentrate from a received
5 container to be mixed with diluent from the diluent supply means when a drink is selected; a detector for detecting whether a received container has sufficient concentrate to make a drink and means for providing an electrical signal indicating whether the container has
10 sufficient concentrate to make a drink.

The invention is described further by way of example with reference to the accompanying drawings in which:

Figure 1 diagrammatically represents a drink dispenser in which the invention is embodied;

15 Figure 2 shows a concentrate supply arrangement comprising a bottle, shown partly in section, containing liquid concentrate for a drink and a concentrate dispensing unit;

Figure 3 shows a concentrate dispensing unit
20 received in a support according to a preferred embodiment of the invention shown in section;

Figure 4 is a perspective view of the support cut away at the line IV-IV shown in Figure 3;

Figures 5 and 6 show an electrical circuit used in
25 the preferred embodiment of the invention;

Figure 7 is a graph showing voltages at various points in the electrical circuit of Figures 5 and 6 when in use;

Figure 8 is a view similar to Figure 2, showing a concentrate supply arrangement including a detector circuit component;

Figure 9 is a view similar to Figure 3, showing the concentrate supply arrangement of Figure 8 in a support; and

Figure 10 is a view similar to Figure 4 taken in line X X of Figure 9, showing one of the electrical contacts of the support.

With reference to Figure 1, the drink dispenser comprises a carbonation chamber 1 to which is connected a diluent supply means 2, which in this embodiment is for supplying water to be carbonated. A carbon dioxide supply means 3 is connected to the chamber 1 by a conduit 4 for supplying carbon dioxide thereto. Carbonated water is supplied from the carbonation chamber 1 to a discharge arrangement 5 of a concentrate supply arrangement 6 by one or more conduits 7. Carbonated water and concentrate are discharged into a vessel such as a cup or glass 8 to form a flavoured carbonated drink when the dispensing device is in use.

The carbonation chamber 1 contains a carbonating device which may be of conventional form e.g. a nozzle for injecting carbon dioxide into the water, but is preferably as described in our published British Patent application No. 2161089 (and EP-A-166586). The water supply arrangement and carbon dioxide supply means may also be as described in that published British Patent

application.

The present invention may alternatively be embodied in a drink dispenser for use with non-carbonated water simply by omitting the carbonation chamber 1 and the carbon dioxide supply means 3. In a further alternative, the operation of a carbonation chamber may be controlled to provide carbonated or non-carbonated water at its outlet, dependant on whether the user selects a carbonated or non-carbonated drink.

10 With reference to Figure 2, the concentrate supply arrangement 6 comprises a container 11 preferably made from moulded plastics material for storing concentrate, and a concentrate dispensing unit 12 which is secured to the container 11, and is for dispensing concentrate
15 therefrom in metered quantities. The concentrate dispensing unit 12 is preferably as described in our published European Patent application No. 0478624. Initially, the container 11 is filled with liquid concentrate 13 to be mixed with water to provide a
20 flavoured drink. The liquid concentrate dispensing unit 12 is sealed to the container 11 during production by push fitting a resilient annular collar 14 of the concentrate dispensing unit 12 over a corresponding outwardly directed annular flange on the neck 15 of the
25 container 11.

The resilient annular collar 14 of the concentrate dispensing unit 12 is supported by a coaxial annular base 16 which on the side remote from the collar 14 carries

a coaxial side wall 17 which has a downwardly tapering frusto-conical upper portion closest to the base 16 and a cylindrical lower portion furthest from the base 16 (as seen in Figure 2). The cylindrical portion of the side wall 17 carries two parallel outwardly directed annular flanges 18 on its circumference which are spaced in the direction of an axis passing through the centre of the side wall 17 and extend radially by equal amounts from the cylindrical surface of the side wall 17. The side wall 17 has a series of holes 19, one of which is shown in Figure 2, spaced around its circumference between the flanges 18. Metered quantities of concentrate are dispensed from nozzle 20 of the concentrate dispensing unit 12 by permitting fluid pressure to enter the dispensing unit 12 through holes 19 as described in EP-A-0478624.

Figure 3 shows a concentrate dispensing unit 12 received in a support 30. The annular flanges 18 are formed of resilient material such as soft plastics material e.g. low density polyethylene which forms a seal with the support 30, and which form a sealed annular chamber 31 around the holes 19 when the concentrate dispensing unit 12 is received in the support 30. When the concentrate dispensing unit 12 is fully inserted into the support 30 a conduit 32 formed in the support 30 communicates with the annular chamber 31. Fluid pressure to operate the concentrate dispensing unit 12 as described in EP-A-0478624 is supplied through the conduit

32, preferably as a pressurised gas. As concentrate is dispensed from the concentrate dispensing unit 12 through nozzle 20, water is supplied through conduit 33 to be mixed with the dispensed concentrate to supply a flavoured drink through outer nozzle 34.

The support 30 also has a detector comprising two capacitive plates 35, 36 preferably made from metal, with one arranged on each side of a concentrate dispensing unit 12 when it is received in the support 30. Each capacitive plate 35, 36 is connected to a part of an electric circuit used to determine the capacitance of the detector by a screened lead 37, 38. The concentrate in a received concentrate dispensing unit 12 acts as a dielectric between the two capacitive plates 35, 36 so that the capacitance of the detector varies dependent upon the level of concentrate in the concentrate dispensing unit 12. When the level of concentrate falls below a predetermined minimum level, the electrical circuit connected to the capacitive plates 35, 36 is arranged to provide an electrical signal indicating that the container does not have sufficient concentrate to make a drink. The capacitive plates 35, 36 are preferably as close to the top of the concentrate dispensing unit 12 as possible as the greatest signal level discrimination occurs at the level of the capacitive plates 35, 36 and the entire contents of the unit 12 is normally used to make one drink. However, the capacitive plates 35, 36 are shown in Figure 3 at the

level of about 80% of the concentrate dispensing unit maximum fill level due to constructional considerations. A drink dispenser incorporating the detector can then be arranged not to accept payment for drinks, or if the
5 dispenser can dispense a variety of drinks, to indicate that that particular drink is not available when the level of concentrate falls below the predetermined minimum level.

The capacitive plates 35, 36 are preferably
10 positioned on the inner wall 40 of the support 30 to be as close to a received concentrate dispensing unit 12 as is practical and are preferably diametrically opposed as shown in Figure 4 to obtain the strongest readings.

The capacitive plates 35, 36 shown in Figure 4
15 follow the profile of the received concentrate dispensing unit 12 and each have a length of 25% of the circumference of the unit 12. In the illustrated embodiment, the length of each plate is 35mm and the width 5mm.

20 Figures 5 and 6 show a preferred embodiment of an electrical circuit to determine the capacitance of the detector. A first capacitive plate 35 shown in Figure 5 is driven by an electrical signal oscillating at high frequency and a second capacitive plate 36 is used as a
25 detector to measure the amplitude of the signal received from the first capacitive plate 35.

The capacitive plate 35 is driven by an oscillator
50 configured to supply a 50kHz square wave output

signal. The precise frequency and wave form is not critical to the operation of the detector and may be any frequency above 10kHz. At lower frequencies signal coupling between the capacitive plates starts to reduce, while for frequencies above 100kHz electro-magnetic emissions may interfere with other equipment. Each of the leads 37, 38 connected to the capacitive plates 35, 36 are screened to reduce the pick up of external interference. Each screen is made off adjacent to its respective capacitive plate 35, 36 and connected to an earth. The oscillating signal received on second capacitive plate 36 is transmitted through screened lead 38 and amplified by a pre-amplifier 51 shown in Figure 6, rectified by rectifier 52 to provide a d.c. voltage signal and offset and further amplified by offset amplifier 53, with both amplifiers being supplied with a reference voltage from circuit 54. The output from offset amplifier 53 is then passed to a comparator 55 which determines whether the d.c. voltage signal is greater or less than a reference voltage. The output of the comparator switches a transistor 56 to indicate whether or not the concentrate dispensing unit 12 received in the support 30 between the capacitive plates 35, 36 has sufficient concentrate to dispense a flavoured drink.

Pre-amplifier 51 has a gain of 100 and produces an output signal at the oscillator frequency from the signal detected at second capacitive plate 36. With no

concentrate in the part of the concentrate dispensing unit 12 received between the capacitive plates 35, 36 the output signal of pre-amplifier 51 is 2.0V peak to peak and increases to 4.9V peak to peak for a full concentrate dispensing unit 12. Measurement results for different levels of the liquid in the concentrate dispensing unit 12 are as shown in the graph of Figure 7.

The rectifier 52 comprises capacitor C2, diode D1, diode D2 and capacitor C3. The rectifier 52 level shifts and rectifies the output of pre-amplifier 51 to give a d.c. voltage. The output of rectifier 52 is 1.3V for an empty concentrate dispensing unit 12 and 3.6V for a full concentrate dispensing unit 12 as also shown in Figure 7.

Offset amplifier 53 level shifts and amplifies the output of rectifier 52. The output voltage levels of offset amplifier 53 are also shown in Figure 7.

The output of offset amplifier 53 is connected to the input of comparator 55 which in this embodiment has a switching point set at 8V as shown by a broken line in the graph of Figure 7 intersecting the output voltage of the offset amplifier 53. The output from the comparator 55 is used to switch an open collector transistor 56 switchable between two positions to indicate whether or not the concentrate dispensing unit has the desired level of concentrate required to prepare at least one flavoured drink.

The capacitor plates 35, 36 used to produce the

results shown in Figure 7 were positioned at approximately 50% of the maximum fill level of the concentrate dispensing unit 12 for mechanical convenience in the prototype. Consequently the greatest change in output voltage for a given change in concentrate volume of the concentrate dispensing unit 12 or signal discrimination is achieved near the 50% fill level of the unit 12. For greater signal discrimination nearer the normal maximum fill level of the unit 12, the capacitive plates would be positioned nearer the top of the concentrate dispensing unit 12.

The voltage levels shown in Figure 7 were obtained by gradually filling a concentrate dispensing unit 12 received between capacitive plates 35, 36 with water. However, tests have shown that filling a received container with concentrate for other drinks such as cola, lemon and lime, beer and tea produce substantially equivalent output voltage signals.

Figures 8 to 10 illustrate a further embodiment of the invention in views similar to Figures 2 to 4. Like reference numbers are used to designate corresponding parts.

In the concentrate supply arrangement seen in Figure 8, capacitor plates 35, 36 (one only visible) are attached to the conical part 17 of the dispensing unit 12. The capacitor plates may for example be formed from self-adhesive metal foil. A locating lug 45 extends outwardly from the conical surface 17 adjacent its

junction with cylindrical base 16.

The support 30 illustrated in Figures 9 and 10 includes a locating recess 46 into which the locating lug 45 is received when the concentrate dispensing unit 6 is placed in the support 30, to ensure correct angular alignment between the support 30 and the unit 6 about a vertical axis.

On the inner wall 40 of the support 30 are mounted a pair of contact elements 47 (only one shown) which make electrical contact with respective capacitor plates 35, 36 mounted on the dispensing unit 6'. Leads 37 and 38 connect the contacts 47 to the remainder of the detector circuit.

Once the dispensing unit 6 has been mounted in the support 30, the detection circuit is completed by the electrical contact between the capacitive plates 35, 36 and the contact elements 47, and the circuit functions in the manner described in relation to Figures 1 to 7.

It will be appreciated that the locating lug 45 and its corresponding recess 46 may be replaced by visual alignment marks on the support 30 and the unit 6, or may be unnecessary if the structure of the unit 6 is such as only to be receivable in the support 30 in a limited range of angular orientations.

It is further foreseen that by offsetting the capacitor plates in the axial (vertical, in use) direction of the unit 6, then a first plurality of circumferentially spaced contacts 47 connected to one of

the leads 37 may be provided at a first axial position, and a second plurality of circumferentially spaced contacts 47 connected to a second lead 38 may be provided at a second axial position so that a first capacitor plate engages at least one of the contacts 47 of the first array, and the second capacitor plate engages at least one of the contacts of the second array. In this way, the installation of the unit 6 in the support 30 may be made independent of angular orientation, since the axial spacing of the contacts ensures that each array is specific to one of the plates.

In a further alternative, a pair of circumferentially extending and axially spaced contact rings may be provided on the unit 6, with the capacitor plates or an induction coil mounted therebetween. Respective plates, or respective ends of the coil, would be connected to respective contact rings, and axially spaced contact elements 47 in the support would each connect one of the rings to a respective lead. The angular orientation of the unit 6 in the support 30 would thus be immaterial, since a contact element 47 would contact its respective ring in all relative angular orientations of the unit 6 and support 30.

Various modifications are possible within the scope of the invention. For example, the detector need not comprise capacitive plates but may, for example, be a coil or comprise means for optically detecting whether a container has sufficient ingredient to supply at least

one flavoured drink. For example the detector could comprise a light source arranged to direct light onto a photodetector such as a photodiode or phototransistor when the concentrate level of a received container falls
5 below a predetermined level at which a flavoured drink can no longer be dispensed but in which the concentrate prevents light or reduces the amount of light reaching the photodiode when it is above the predetermined level, or vice versa. The output of the photodiode could be
10 used to provide an electrical signal, possibly via a comparator with a reference voltage applied to its other input, to indicate whether or not the received container has sufficient concentrate to make a drink.

Whilst the above example works well for opaque
15 concentrates such as for cola, tea or coffee it does not work so well for transparent concentrates such as for lemonade. For such concentrates a light source can be arranged to direct light onto a surface of the concentrate in a received container such that when the
20 concentrate has fallen to a predetermined level at which a flavoured drink can no longer be dispensed, the light is either reflected at the liquid surface to impinge on a detector such as a photodiode, or reflection no longer takes place and the light no longer strikes the detector.
25 The photodiode may be connected to a latch, triggered by the signal from the photodiode, to provide an electrical signal indicating that there is no longer sufficient concentrate to dispense a flavoured drink. Manual or

automatic means may be provided to reset the latch when the concentrate supply is replenished.

In a further alternative embodiment a source of sound or ultrasound may be used to direct sound waves through the container to a detecting microphone or sensor, and variation in the detected sounds used to indicate the presence or absence of concentrate. If the sensor is placed so as to be below the concentrate surface when the amount of concentrate remaining is sufficient, and above the concentrate surface when the amount of remaining concentrate is insufficient, then the difference in sensed sound can be used to determine whether a flavoured drink can still be dispensed. The remaining concentrate may be used to conduct sound from the source to the detector by placing both below the concentrate surface, or the concentrate may be used to mask the detector from sound by placing the detector below and the source above the surface. As the surface falls to expose the detector, in the first arrangement the detected sound level will fall and in the second arrangement the detected sound level will rise, and in either case the change can be sensed and used to determine whether the amount of remaining concentrate is sufficient.

In both the optical and acoustic embodiments described, the source and detector for light or sound may be mounted either in the support, or directly to the concentrate container with electrical contacts in the

support and on the container providing power supply and sensing output lines to and from the source and sensor.

Furthermore, the electrical circuit may comprise any system able to differentiate between the appropriate
5 output signal levels of the detector. For example, if the capacitive detector is used it could form part of an oscillator which could switch between an oscillating state and a non-oscillating state dependent upon the capacitance of the detector. The capacitance of the
10 detector at which the oscillator switches from the non-oscillating state to the oscillating state could be set to correspond to the volume of concentrate required to produce at least one flavoured drink. Alternatively, the frequency of oscillation may be arranged to vary with the
15 volume of concentrate present, and by comparing the oscillating frequency with a reference frequency, a determination of the amount of concentrate can be made.

In addition to the capacitive detector, the electrical circuit could also include a reference
20 capacitor designed to have the same capacitance as the capacitive detector when no object is close to the sensing electrodes, to compensate for noise pick-up.

As an alternative to use with liquid concentrate, the dispensing apparatus could be used with powdered
25 concentrate. The concentrate dispensing unit could then comprise a hopper arranged to dispense predetermined volumes of powdered concentrate.

CLAIMS:

1. An apparatus for determining whether a drink dispenser for dispensing a drink comprising a diluent and
5 a concentrate is able successfully to dispense a drink, the apparatus comprising a detector for detecting whether a container for holding concentrate for a drink to be dispensed contains more than a predetermined amount of the concentrate.
10
2. The apparatus according to claim 1 comprising;
a support for receiving at least partially a container for holding concentrate for a drink to be dispensed by a drink dispenser;
15 the detector being arranged to detect whether a container received on the support contains more than a predetermined amount of concentrate to make a drink; and
means for providing an electrical signal based on the detection result, indicating whether or not the
20 container has sufficient concentrate to make a drink.
3. The apparatus according to claim 2, wherein the container comprises a reservoir portion and a dispensing portion operable to discharge a predetermined amount of
25 concentrate from the reservoir, and the part of the container received in the support includes at least a part of the dispensing portion of the container.

21

4. The apparatus according to claim 2 or claims 3, wherein the detector comprises an electrical circuit with a component having a dielectric; and

concentrate in a container received on the support
5 acts as the dielectric for said component.

5. The apparatus according to claim 4, in which, in use, the detector does not compromise the integrity of a container received on the support.

10

6. The apparatus according to claim 4 or claim 5, wherein the component comprises a pair of capacitive plates.

15 7. The apparatus according to claim 6, in which the pair of capacitor plates are arranged such that, in use, at least a portion of a container is received on the support between them.

20 8. The apparatus according to claim 4 or claim 5, wherein the component comprises an inductive coil arranged such that, in use, at least a portion of a container received on the support is received within the coil.

25

9. The apparatus according to any of claims 4 to 8, in which the electrical circuit includes an oscillating

circuit.

10. An apparatus according to claim 9, in which a characteristic of the circuit is used to provide an electrical signal indicating whether or not a received container contains more than a predetermined amount of concentrate.
11. The apparatus according to claim 6 or claim 7, including means for applying an oscillating signal to a first capacitor plate, and means for rectifying and amplifying an oscillating signal received from the first capacitor plate on the other capacitor plate, to provide an electrical signal indicating whether or not the container contains more than a predetermined amount of concentrate.
12. The apparatus according to any one of claims 2 to 11, in which the detector is arranged to detect the presence of concentrate at a lower portion of a container received on the support.
13. The apparatus according to claim 12 as dependant on claim 3, wherein the lower portion of the container received in the support comprises the dispensing portion.
14. The apparatus according to any one of claims 2 to

13, wherein the means for providing an electrical signal is arranged to prevent a drink dispenser from accepting payment when the detector detects that a container received on the support does not contain a predetermined amount of concentrate.

15. The apparatus according to any one of claims 2 to 14, wherein a plurality of concentrates are held in respective containers, and a similar plurality of drink selections are available to a user, and the means for providing an electrical signal is arranged to indicate that a particular drink is not available when a received container for holding concentrate for that particular drink does not contain a predetermined amount of concentrate.

16. A drink dispenser comprising:
a diluent supply means;
a support for receiving at least partially a container for holding concentrate for a drink to be dispensed by the drink dispenser;
means arranged, in use, to activate the supply of concentrate from a received container to be mixed with diluent from the diluent supply means when a drink is selected;
a detector for detecting whether a received container contains a predetermined amount of

concentrate; and

means for providing an electrical signal indicating whether or not the container contains the predetermined amount of concentrate.

5

17. A drink dispenser according to claim 16, wherein the container comprises a reservoir portion and a dispensing portion operable to discharge a predetermined amount of concentrate from the reservoir, and the part of the
10 container received in the support includes at least a part of the dispensing portion of the container.

18. A drink dispenser according to claim 16 or claim 17, wherein the detector comprises an electrical circuit
15 having a component having a dielectric and wherein concentrate in a container acts as the dielectric.

19. A drink dispensing according to claim 18, wherein the component having a dielectric is mounted to the
20 concentrate container.

20. A drink dispenser according to claim 19, wherein the component having a dielectric is mounted to the concentrate dispensing portion of the container (6).

25

21. A concentrate container for a drink dispensing apparatus having a detector for detecting whether

25

sufficient concentrate remains in the concentrate container to dispense a drink, wherein the detector comprises an electrical circuit having a component having a dielectric and the concentrate forms said dielectric, the container having the said component mounted thereto.

22. A container according to claim 21, wherein a pair of capacitor plates constitute the component.

23. A container according to claim 21, wherein an induction coil constitutes the component.

24. A drink dispenser according to claim 18, for use with a concentrate container according to any of claims 21 to 23, wherein the support includes electrical contact elements for connecting the said component to the detector circuit.

25. An apparatus for determining whether a drink dispenser is able successfully to dispense a drink, substantially as herein described with reference to the accompanying drawings.

26. A drink dispenser substantially as herein described with reference to the accompanying drawings.

27. A concentrate container unit substantially as herein

described with reference to Figures 2 and 3 or Figures 8 and 9 of the accompanying drawings.

FIG. 1

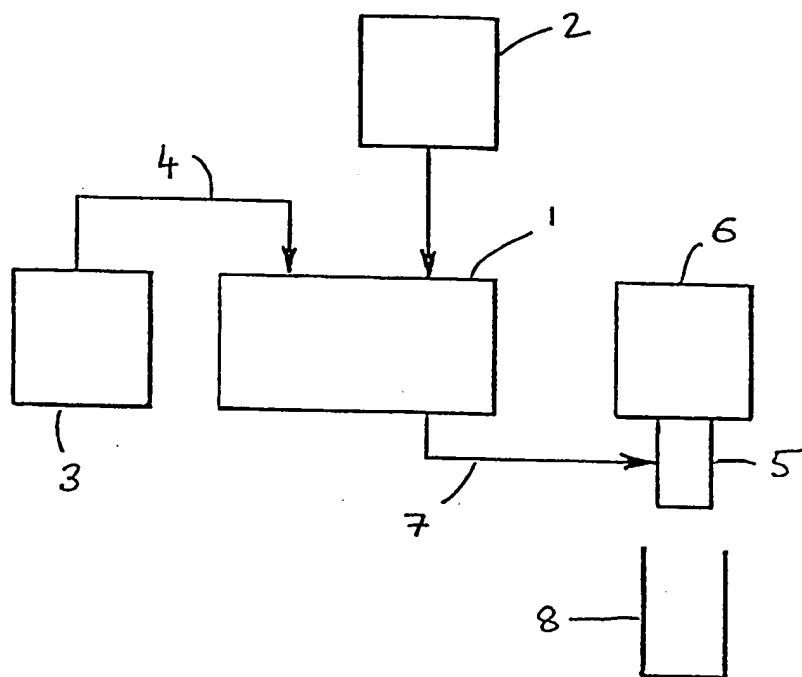
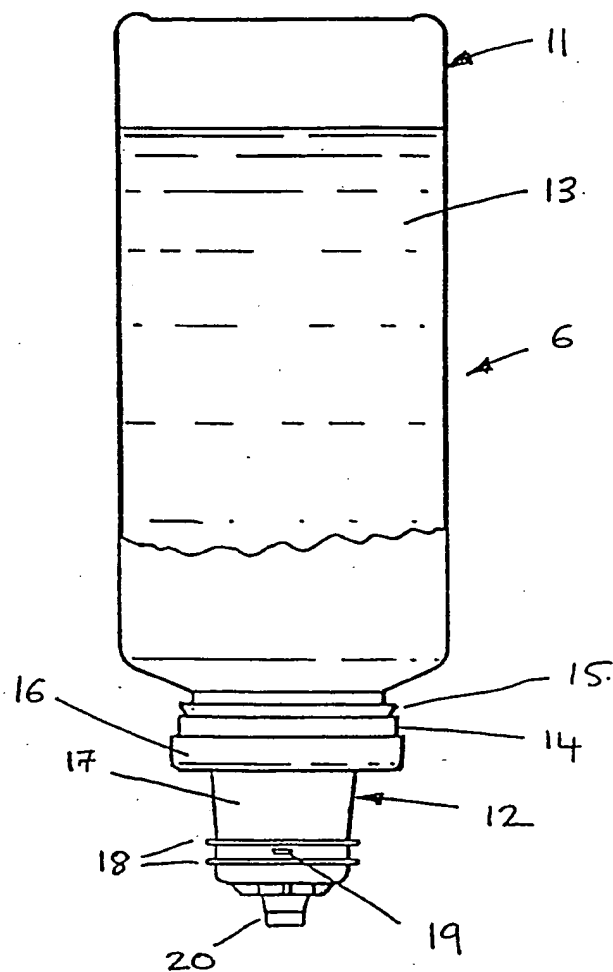
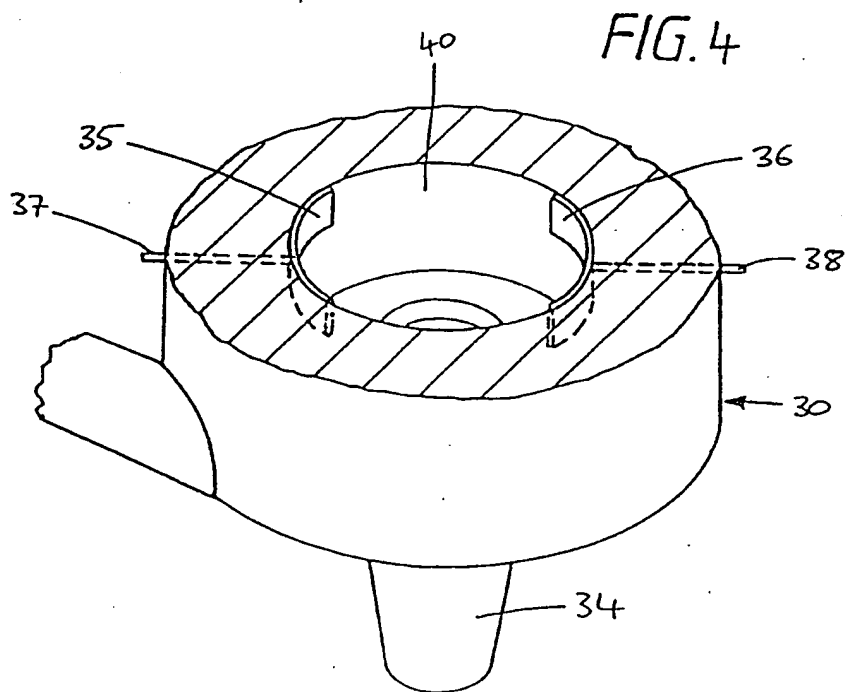
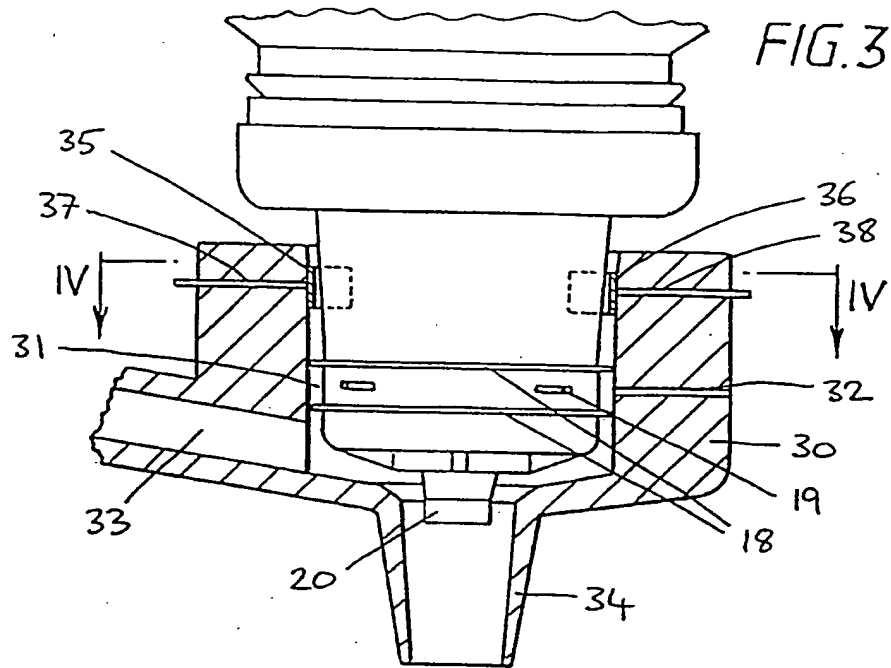
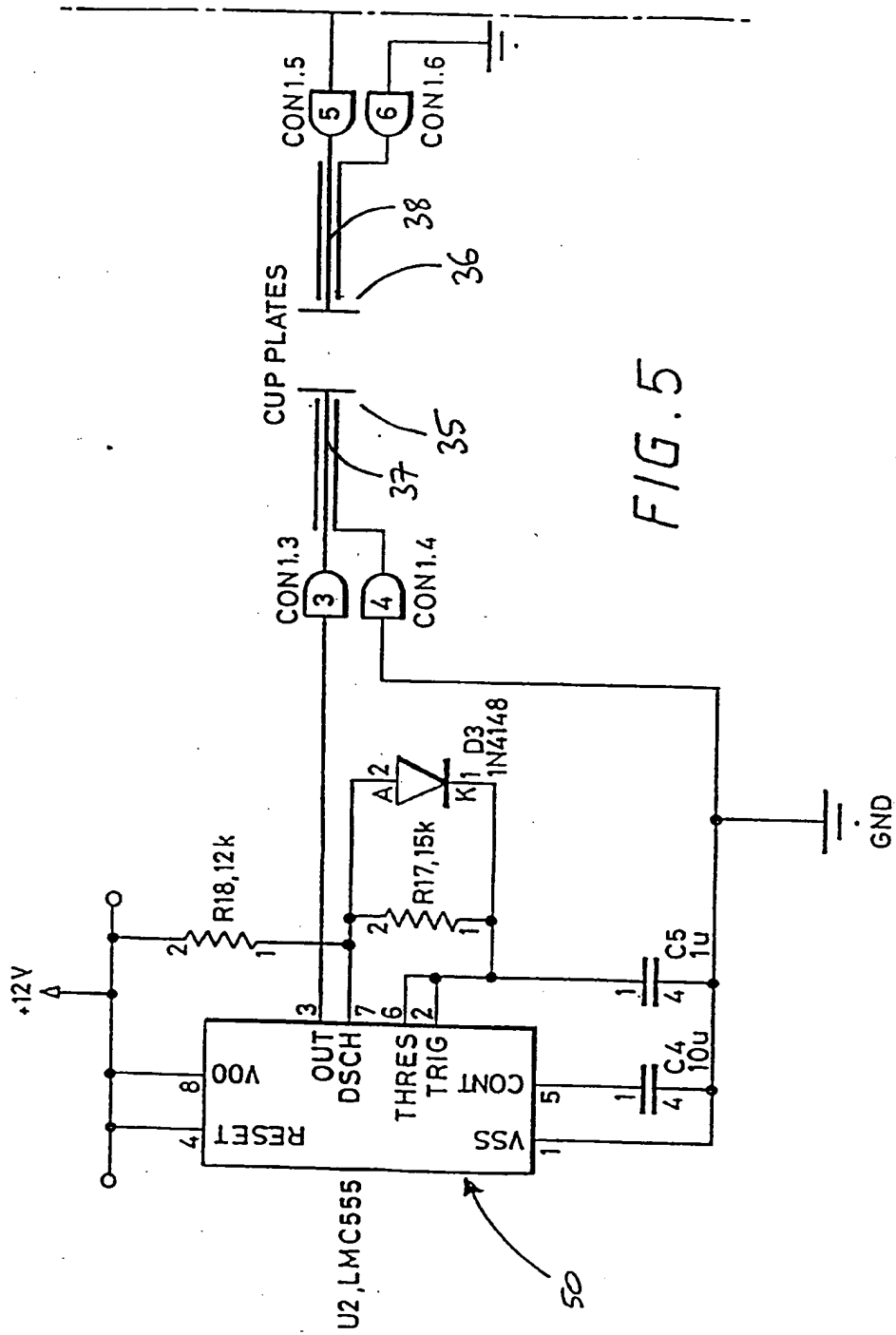


FIG. 2







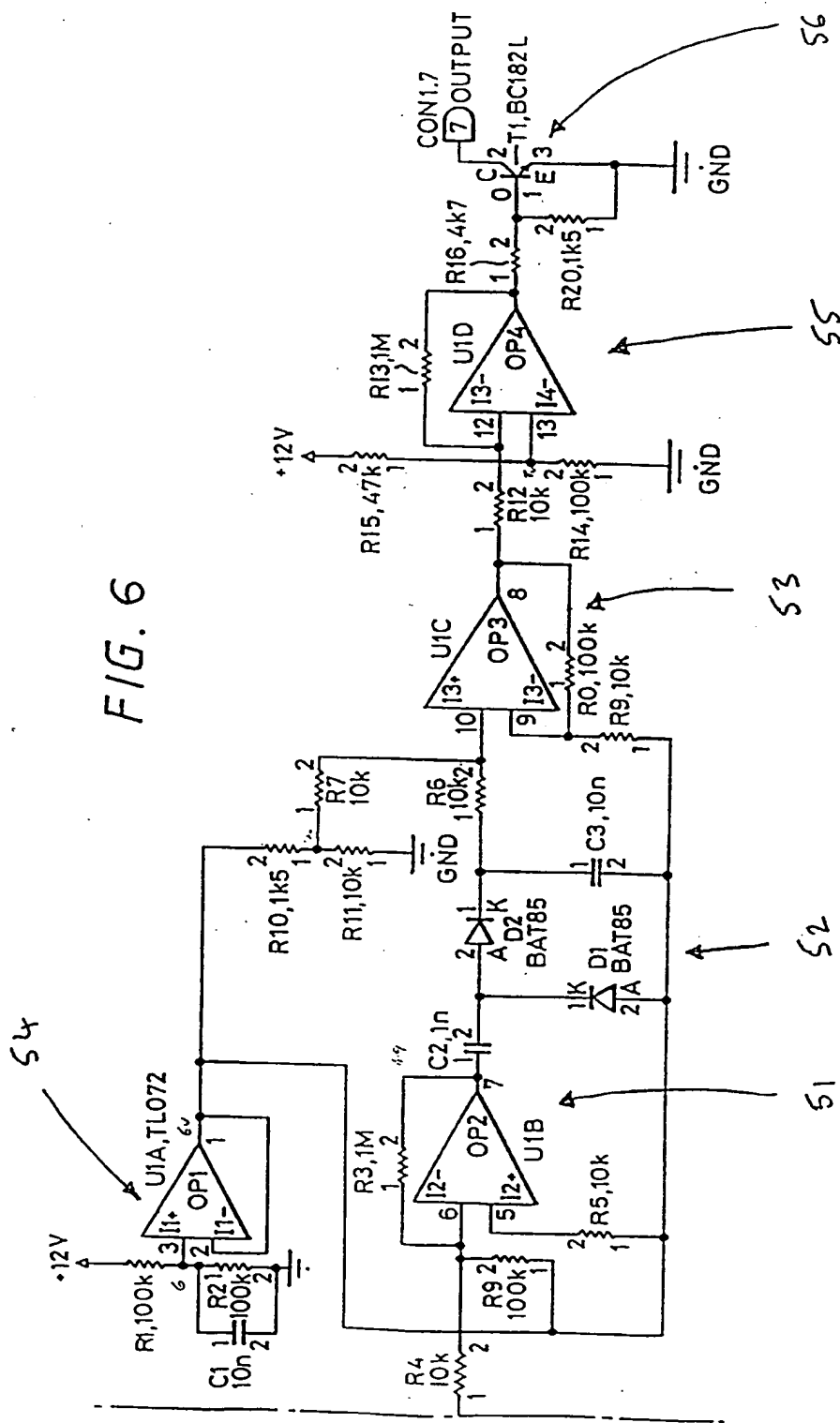


FIG. 7

SIGNAL DETECTOR LEVELS

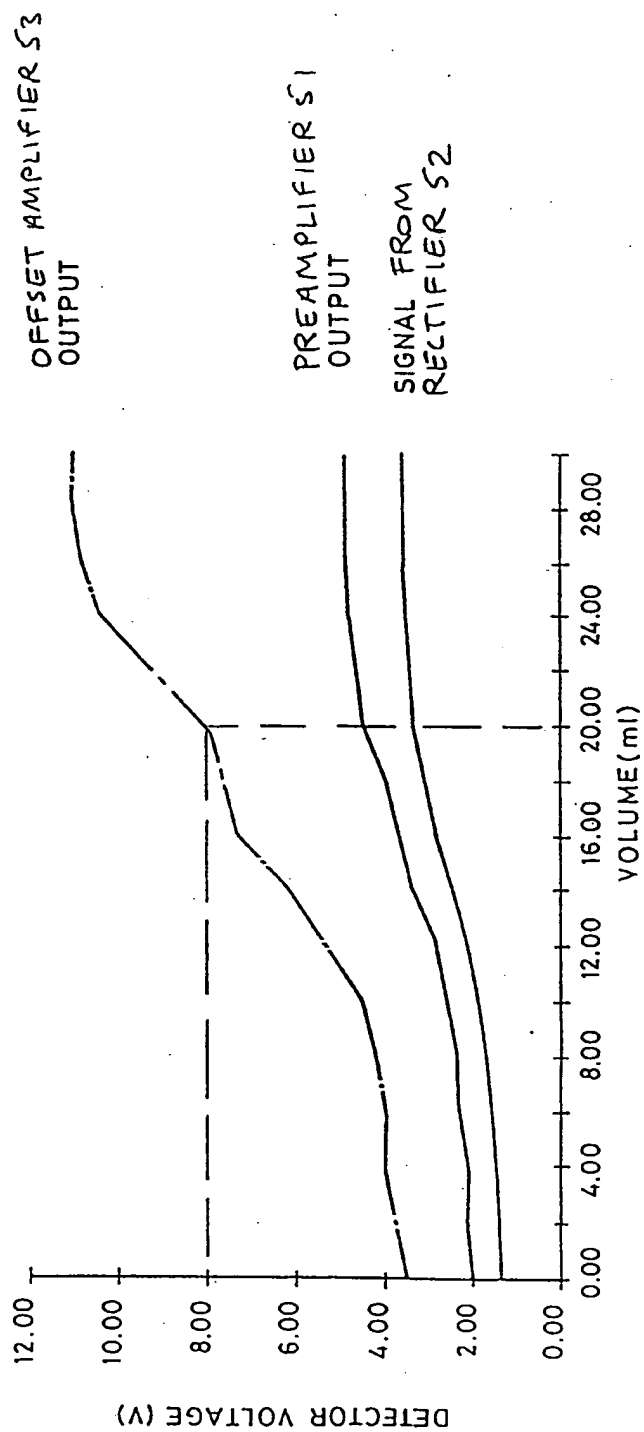
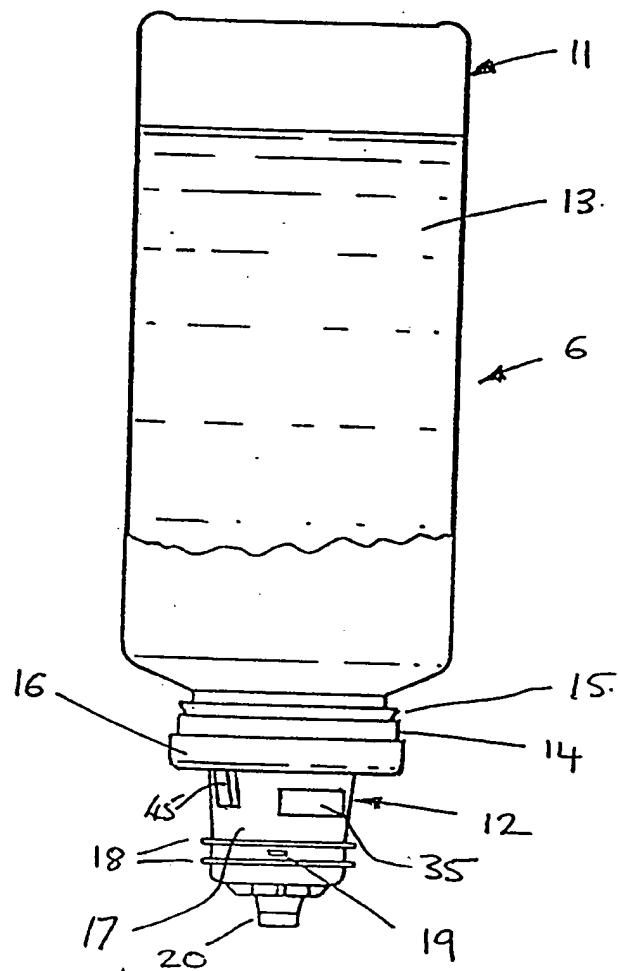
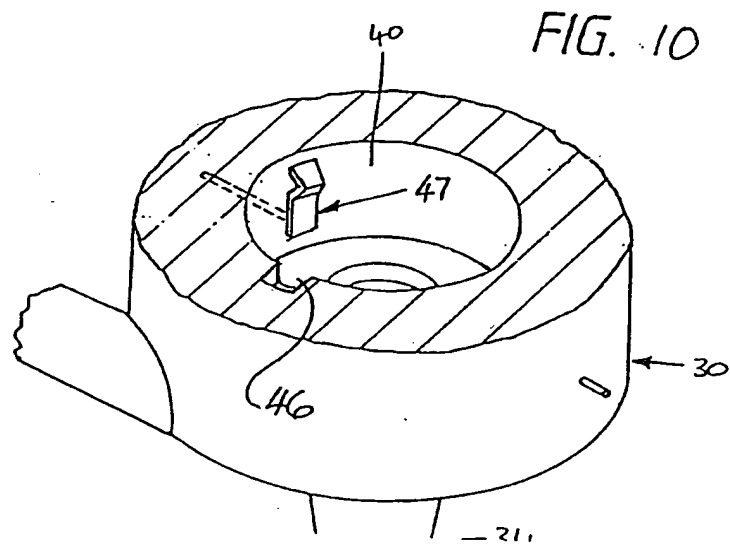
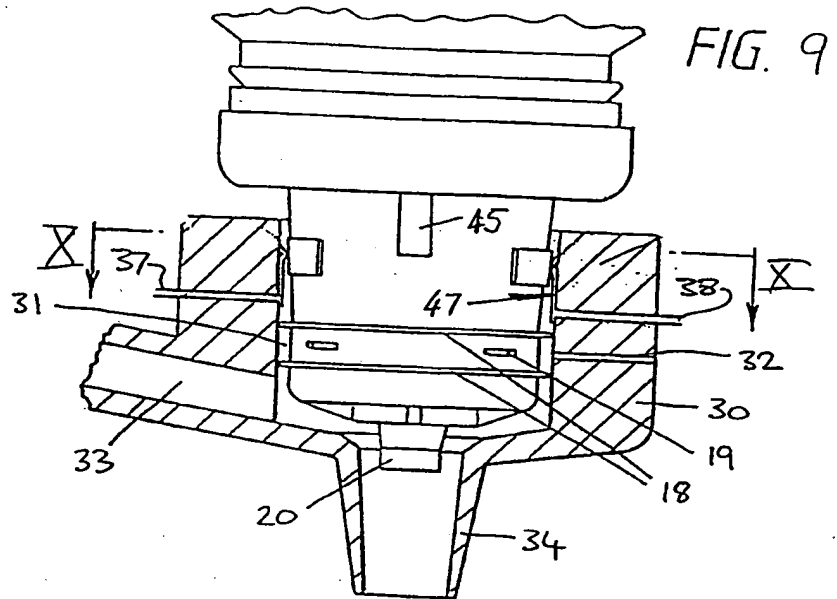


FIG. 8



8/8



PCT/GB 99/01889

IPC 6 B67D1/12 G01F23/26

According to International Patent Classification (IPC) or to both national classification and IPC

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B67D G01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 749 494 A (WOLSKI ET AL.) 12 May 1998 (1998-05-12) column 8, line 61 - column 9, line 4; claims 1,16; figures	1-3,12, 13,15-17
Y	---	4-11,14, 18-20,24
X	US 4 470 008 A (KATO) 4 September 1984 (1984-09-04) column 1, line 11 - line 51; figure 1	21,22
Y	column 4, line 26 - line 36 column 5, line 34 - line 65; figure 6	4-11, 18-20,24
Y	WO 93 22235 A (COSTELLO ET AL.) 11 November 1993 (1993-11-11) claims 1,9 ---	9-11
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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- *A document member of the same patent family

Date of the actual completion of the international search

11 October 1999

Date of mailing of the international search report

25.10.99

Name and mailing address of the ISA

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Fax (+31-70) 340-3016

Authorized officer

Deutsch, J.-P.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/01889

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 957 220 A (DU) 18 September 1990 (1990-09-18) column 6, line 1 - line 20 -----	14
A	US 4 182 176 A (PLAYFOOT ET AL.) 8 January 1980 (1980-01-08) claim 1 -----	8,23
A	DE 40 19 436 A (FEHRENBACH) 2 May 1991 (1991-05-02) -----	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 99/ 01889

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 25, 26, 27
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
Rule 6.2 (a) PCT
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 25 26 27

Rule 6.2(a) PCT

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/01889

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5749494 A	12-05-1998	NONE	
US 4470008 A	04-09-1984	NONE	
WO 9322235 A	11-11-1993	AU 3962393 A GB 2281554 A,B IE 72185 B	29-11-1993 08-03-1995 26-03-1997
US 4957220 A	18-09-1990	NONE	
US 4182176 A	08-01-1980	NONE	
DE 4019436 A	02-05-1991	NONE	